

## PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 71500PC/RO	FOR FURTHER ACTION    See Form PCT/IPEA/416	
International application No. PCT/SE 2003/001337	International filing date (day/month/year) 28.08.2003	Priority date (day/month/year) 29.08.2002
International Patent Classification (IPC) or national classification and IPC H01M2/16		
Applicant EFFPOWER AB et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
  - a. ☒ (sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:
    - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

Date of submission of the demand  05.03.2004	Date of completion of this report  08.11.2004
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer  Lars Hennix/ELY Telephone No. +46 8 782 25 00

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:

- ☐ international search (under Rules 12.3 and 23.1(b))  
☐ publication of the international application (under Rule 12.4)  
☐ international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-16 as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☒ the claims:

pages \_\_\_\_\_ as originally filed/furnished

pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19

pages\* 18-20 received by this Authority on 2004-06-21

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☒ the drawings:

pages 1-7 as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/figs \_\_\_\_\_

☐ the sequence listing (*specify*): \_\_\_\_\_

☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages \_\_\_\_\_

☐ the claims, Nos. \_\_\_\_\_

☐ the drawings, sheets/figs \_\_\_\_\_

☐ the sequence listing (*specify*): \_\_\_\_\_

☐ any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/SE 2003/001337

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	<u>1-18</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-18</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-18</u>	YES
	Claims		NO

## 2. Citations and explanations (Rule 70.7)

The following documents were cited in the International Search Report:

D1: US6108879 A1  
D2: US6071651 A1  
D3: US5180647 A1  
D4: US5091275 A1  
D5: US1063334 A1

The documents cited in the International Search Report represent the background art.

The invention defined in claims 1-18 is not disclosed by any of these documents.

None of the cited documents give any indication towards the claimed separator for battery, the claimed battery, the claimed method of producing a separator for battery. No relevant combination of the cited documents would lead a person skilled in the art to the invention defined in the claims.

Therefore, the invention defined in claims 1-18 is novel and is considered to involve an inventive step. It is also considered to be industrially applicable

DT01 Rec'd PCT/PTO 11 FEB 2005

C L A I M S

1. Separator for battery including a plate shaped structure of inorganic fibers, c h a r a c t e r i z e d in that said separator is impregnated with a dispersion of colloidal  
5 inorganic nano particles that have been enriched in the crossing points of the fibers so as to form binding agent when a solvent of the dispersion has dried.

2. Separator according to claim 1, c h a r a c t e r i z e d in that the separator has been heat treated at a temperature  
10 between 300 and 700°C in order to obtain a considerably greater rigidity.

3. Separator according to claim 1 or 2, c h a r a c t e r i z e d in that the inorganic fibers comprise material of any of the group: glass fiber, mineral  
15 fiber, metal fiber.

4. Separator according to claim 1, 2 or 3, c h a r a c t e r i z e d in that the binding agent includes any of the group:  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Al}(\text{OH})_3$ ,  $\text{TiO}_2$ .

5. Separator according to any of the previous claims, c h a r a c t e r i z e d in that the binding agent  
20 comprises between about 20% and 60% of the total separator weight.

6. Separator according to claim 5, c h a r a c t e r i z e d in that the binding agent comprised between about 25 and 45%  
25 of the total separator weight.

7. Battery with positive and negative electrodes, separators and electrolyte, c h a r a c t e r i z e d in that it

includes at least one separator according to any of the claims  
1 - 6.

8. Battery according to claim 7, c h a r a c t e r i z e d  
in that it is mounted with a pressure at its electrodes of at  
least 100 kPa, preferably 150 - 250 kPa.

9. Battery according to claim 7 or 8,  
c h a r a c t e r i z e d in that binding agent has been  
supplied to the separator in such an amount that it is  
compressible to about 80% of its thickness at an outside  
applied pressure of between 80 and 250 kPa.

10. Battery according to claim 7, 8 or 9 in bipolar form,  
c h a r a c t e r i z e d in that a pressure relieving grid  
is positioned in each negative electrode.

11. Battery according to any of the claims 7 - 10,  
c h a r a c t e r i z e d in that it is comprised of a lead  
battery with sulphuric acid electrolyte.

12. Method of producing a separator for a battery, wherein a  
disk-shaped structure comprising inorganic fibres is used,  
c h a r a c t e r i z e d in that said separator is  
impregnated with a dispersion of colloidal inorganic nano  
particles which are enriched in the crossing points of the  
fibres so as to form binding agent when a solvent of the  
dispersion is made to dry.

13. Method according to claim 12, c h a r a c t e r i z e d  
in that drying of solvent is obtained through drying at raised  
temperature.

14. Method according to claim 12 or 13,  
c h a r a c t e r i z e d in that the separator after drying

21-06-2004

the solvent is heat treated at a temperature between 300 and 700°C in order to obtain a considerably greater rigidity of the bond in said crossing points.

15. Method according to claim 12, 13 or 14,

5 c h a r a c t e r i z e d in that the inorganic fibres including material from any of the group: glass fibres, mineral fibres, metal fibres are used.

16. Method according to any of claims 12 - 15,

10 c h a r a c t e r i z e d in that binding agent from the group:  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{Al}(\text{OH})_3$ ,  $\text{TiO}_2$  is used.

17. Method according to any of claims 12 - 16,

c h a r a c t e r i z e d in that the binding agent is brought to comprise between about 20 and 60% of the total separator weight.

15 18. Method according to any of the claims 12 - 17,

c h a r a c t e r i z e d in that the binding agent is brought to comprise between about 25 and 45% of the total separator weight.